National Aeronautics and Space Administration

Lyndon B. Johnson Space Center

National Institute of Standards and Technology
Technology Administration
U.S. Department of Commerce

Workshop on Purity and Dispersion Measurement Issues in Single Wall Carbon Nanotube Materials

Sponsored by NASA-JSC and NIST

May 27-29th, 2003
NIST HQ, Gaithersburg, MD

Purpose:

The workshop is intended to bring together researchers working in the field of single wall carbon nanotubes (SWCNTs) to develop prioritized measurement needs relevant for characterizing the purity and dispersion of nanotube material.

No single experimental technique exists which can reliably determine the purity of SWCNT material, nor can we assess the composition and properties of the impurities that are generated during SWCNT production. The same is true for assessing the degree of dispersion in liquids and matrices that can influence the SWCNT interactions with other materials. Understanding the properties that facilitate purification and dispersion are critical to the development of all SWCNT applications and for further improving the current purification protocols. Researchers worldwide resort to a combination of available techniques to characterize SWCNTs. However, such a variety of techniques combined with differences in methodology and interpretation complicates the data comparison of SWCNT materials. Furthermore, thorough criteria for assessing dispersion are lacking.

The researchers at NASA-JSC and NIST recognize an immediate need to agree on harmonized characterization techniques, and have joined to organize a three-day workshop to address these issues. ***The focus of the workshop is the purity and dispersion of SWCNT materials.*** The workshop will bring together researchers to discuss current characterization methods and ways to establish consistent protocols. It is hoped that this meeting will foster future workshops to address other aspects of characterization and to understand the interaction of SWCNTs with materials.

Questions to be Addressed:

- What are the best practices for characterizing purity and dispersion in SWNTs?
- What issues need to be addressed to obtain common measurement methodologies?
- What are the priorities NIST, NASA, and the community should be working on together?

Workshop Format:

- Invited review talks
- Discussion period following each talk
- Contributed posters and a limited number of contributed papers
- Open forum discussions
- Breakout sessions to focus on specific aspects of purity and dispersion
- Session to prioritize the important measurement needs

Workshop Issues and Topics:

Current methods to assess the purity of SWCNT material:

- Carbon and Non-carbon content.
- Identifying different types of carbon including SWCNTs, fullerenes, graphite, and amorphous carbon.
- Morphology of SWCNTs and impurities.
- Derivatized SWCNTs, extent of functionalization and defective SWCNTs.
- Metal aggregates, metal compounds and carbon covered particles.
- Theoretical work to monitor purity and reactivity.

Methods to assess the dispersion of SWCNT material:

- Stability and solubilization of SWCNT bundles (Macro dispersion).
- Unbundling of large ropes into smaller ropes and individual SWCNTs (Nano dispersion); ways to maintain the state of dispersion.
- Novel methods to monitor macro- and nano-dispersion in solids, thin films, gels, liquids and gases.
- Bonding of carbon and non carbon, van der Waals forces, size and shape of SWCNTs.
- Computations on the reactivity of SWCNTs and effects on dispersion.

Improving the purity and dispersion of SWCNT material:

- Penalties involved in improving the purity of the SWCNT material.
- Difficulties involved in maintaining the dispersion and purity of the material for mechanical, electrical and thermal applications.
- Consistency of SWCNT material.

Conference Fees and Accomodations:

Registration Fee of $300.00 is due by May 14, 2003. To register online, go to www.nist.gov/public_affairs/confpage/new030527.htm. For questions, call Cindy Montgomery, (301) 975-2955. Hotel accommodations are provided at the nearby Quality Suites, (301) 840-0200.

Workshop Proceedings:

The contributors will be asked to submit papers for the conference proceedings to be published in the Journal of Nanoscience and Nanotechnology.

Scientific Advisory Committee:

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